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MARKET SHARE REWARDS TO PIONEERING BRANDS: AN EMPIRICAL ANALYSIS AND STRATEGIC IMPLICATIONS*

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An empirical analysis indicates that the order of entry of a brand into a consumer product category is inversely related to its market share. Market share is modeled as a log linear function of order of entry, time between entries, advertising, and positioning effectiveness. The coefficients of the entry, advertising, and positioning variables are significant in a regression analysis on an initial sample of 82 brands across 24 categories. These findings are confirmed by predictions on 47 not previously analyzed brands in 12 categories. Managerial implications for pioneers and later entrants are identified.
(MARKETING; COMPETITION; NEW PRODUCTS)

Introduction

One strategy for new product development is based on innovation and the creation of new markets. It is expensive and risky to be a pioneering brand (Urban and Hauser 1980). The costs of development are often large and the first firm in a market must allocate funds to make consumers aware of its product and convenience them to buy it. The risk of failure is high because the potential demand is not known with certainty. An alternative strategy is based on being the second (or later) entrant into the market. The costs may be lower since the innovator has created the primary demand and the basic product design exists; the risk also may be less because a proven demand exists. If an equal market share can be gained, this strategy could be more profitable. If, on the other hand, as a result of being the first entrant in a market, a dominant market share is achieved and maintained, the innovation strategy may be superior. The purpose of this paper is to investigate the market share effects of being a pioneering brand.

If the market grants a long-run market share reward to early entrants, this would encourage innovation. From a public policy point of view, this would serve a similar function to that of patents by providing an additional reward to innovators. Although patents sometimes provide protection, in many cases they are ineffective because of difficulties of establishing and protecting the rights and the ability of other firms to "invent around" the patent as technology advance (von Hippel 1982). This difficulty of protecting an innovation is compounded by the fact that imitators generally take less time and require fewer funds to copy the innovation (Mansfield, Schwartz, and Wagner 1981). If pioneering brands earn a long-run market share advantage, the effectiveness of patent protection may be less critical in providing incentives for innovation and firms may be more willing to innovate without patent protection.

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Several authors have argued on theoretical grounds that such long lived advantages can exist. Early ideas by Bain (1956) indicated that existing products can have an advantage accruing from fundamental consumer traits that lead to stable preference patterns. If an experience curve is present, production costs for the pioneer may be lower because its cumulative production is likely to be greater than later entrants (Abell and Hammond 1979). If the pioneer can not only gain a cost advantage but also erect barriers to entry (Porter 1980), sales advantages may be even greater.

Recent theoretical work by Schmalensee (1982) is based on the fundamental notion that once buyers use the first entrant's product, they will be willing to pay more for it, if it works, because they are not certain the second product will work. Based on a number of assumptions (e.g., products either work or do not work, second entrant objectively equal to first, no response by pioneer to new entrant, and no advertising effects) he shows that a long-run price advantage can persist for the pioneering brand. In this model, the second entrant must offer a price reduction to persuade consumers to try and learn about the product. This can imply higher profits for the pioneer. Lane and Wiggins (1981) also assume that consumers only know the exact quality of the products they have used. Their model is similar to Schmalensee's but includes advertising and some response by the pioneer to later entrants. After examining profit maximizing strategies they find "even with entry, the first entrant's advantage persist in the form of higher demand and profitability" (p. 3).

Hauser and Shugan (1983) have formulated a defensive strategy model which uses the product positioning of the new entrant to determine share. In this model, the persistence of the sales levels of pioneering brands depends on how well the pioneer designed the product attributes to meet heterogeneous consumer preferences. If the "best" positioning was chosen by the first firm, later entrants may have lower market shares because, if they want to differentiate, they must adopt an inferior position. However, if the first brand to enter did not fully understand consumer preferences, the second entrant could get a preferential positioning advantage and earn a greater share.

These theoretical models show the possibility of long-run market share rewards for pioneering brands and indicate these rewards also will be a function of the product positioning and pricing strategies of the new and old products.

A limited amount of empirical analysis on the benefits of early entry has been reported. Biggadike (1976) studied 40 industrial product entries into new markets represented by large firms in the PIMS project. He found that after four years the average share of these entrants was 15 percent while the share of the largest existing competitor in each of the 40 businesses decreased from 47 percent to 28 percent when new entrants came on the market. These data suggest that although the share of the pioneering brand decreases as a result of subsequent entry, shares may not equalize.

Robinson and Fornell (1985) studied the PIMS data for 371 consumer goods business units that were in the mature phase of their life cycle. In this sample firms designated themselves as "pioneers, early followers, or later entrants." "Pioneers" had an average share of 29 percent while "early followers" had 16 percent share and "later entrants" had 11 percent market share. The authors conducted an econometric analysis to uncover the mechanisms underlying the share differences. They found that pioneers tended to have higher quality products and a broader product line. In convenience goods, market pioneers gained additional advantages due to distribution effects. Pioneers also benefited in markets with low price and low purchase frequency. This cross-sectional study provides evidence of order of entry effects at the business unit level.

Two longitudinal industry studies have been conducted which have information relevant to entry effects. The first is by Bond and Lean (1977) and reflects a study of two related prescription drugs (diuretics and antiaginals). A historical review and time

series regression analysis of the sales, entry and promotion in each of these markets led the authors to conclude for these prescription drugs that "the first firm to offer and promote a new type of product received a substantial and enduring sales advantage" (p. vi). Neither heavy promotional outlays nor low price dislodged the pioneers. However, later entrants that offered therapeutic novelty did achieve substantial sales volumes when backed by heavy promotional expenditures. They found that "large scale promotion of brands that offer nothing new is likely to go unrewarded" (p. vi).

Another interpretative study of trends in seven cigarette submarkets by Whitten (1979) led to the finding that the "first entry brand received a substantial and enduring sales advantage" in six of the seven cigarette market segments (p. 41). She found, however, that later entry brands which were early in a growing market or which were significantly differentiated could gain a substantial share in the market or even dislodge the first entry brand from its dominant position.

These theoretical and empirical analyses suggest order of entry may affect the market share potential of later entries and that this effect may be modified by the entrant's positioning, quality, pricing, and marketing strategy. This paper enlarges the body of empirical knowledge by a cross product analysis over many categories of frequently purchased brands of consumer goods. It includes effects of order of entry as well as advertising and product positioning. We begin by describing the data base and specifying the statistical model. Then we describe its fit to an initial data base of 82 brands, assess its predictive ability on a new sample of 47 brands, and present a re-estimation of the model parameters based on the pooled data. We consider the strategic implications of our findings and close with a discussion of future research needs.

Data

Pre-test market assessment procedures have been widely used in the markets for frequently purchased brands of consumer products. One such system, called ASSESSOR (Silk and Urban 1978), provides a rich data base for the study of order of entry effects. In this procedure, data on existing products are collected first and then new product response is measured. We are concerned here with only the data on existing products. Studies were carried out in the 1979–82 period. In each category studied, 300 (or more) respondents were interviewed to determine their evoked set of brands, their preferences for these brands (constant sum paired comparisons across each consumer's evoked set), the last brand they purchased, and ratings of selected evoked brands on product attribute scales.[1] These data allow market shares to be estimated by the fraction of the sample which last purchased the brand. The preference and ratings data supply a basis of determining product positioning and differentiation. An initial sample of 24 categories was selected for exploratory analysis. 82 major brands existed across these categories. After the collection and analysis of the initial sample, data for 47 different brands were made available. This second sample became the data for predictive testing. The products in these samples represented tightly defined categories of frequently purchased goods (e.g., liquid detergent, instant freeze dried coffee, fabric softener, anti-dandruff shampoo). The categories were well established. The average time in the market for second entrants was 25.9 years, third entrants 20.5 years, fourth entrants 15.2 years, fifth entrants 8.9 years, and sixth entrants 6.2 years. These data

[1] The respondents were intercepted at a shopping mall, screened for category usage, and interviewed if they were within the age and demographic quotas established in the stratified sampling plan for each study. The evoking is based on positive unaided response to one of the following conditions: now using, ever used, on hand, would consider using, or would not consider using. Approximately 90% of evoking is associated with use experience.

were supplemented by advertising expenditures obtained from the *Leading National Advertisers* published media audits. Although these audits may not report 100 percent of each brand's spending, they are useful in comparing advertising expenditures if we assume no biases in relative advertising. Since the brands considered had been on the market at least two years, these spending levels represent post-introductory expenditures.

The order of entry was determined by identifying the time of national introduction for each brand. This was done by personally calling the firms which market each of these products and determining when it was introduced. In the few cases where the firms were not willing to provide this data, at least two competitors were asked to provide an estimate of the entry time and their average response was utilized.

These data provided a cross sectional data base for the investigation of order effects. At the time of each study, the shares for the existing brands, the year of each product's entry into the market, the brand's recent advertising spending, and the relative product preferences are known.

Statistical Model

The dependent variable in this study is the ratio of the market share of the *n*th (second, third, fourth . . .) brand to enter the market to that of the first product to enter. Since the number of brands in each category varies, the absolute shares also vary; the ratio allows a meaningful comparison of relative relationships of brands within and across categories. Brands are included in the analysis if they were advertised at a significant level (greater than one million dollars per year) and a reasonable share estimate could be obtained (at least 30 respondents reporting a specific brand as last brand purchased).

The order of entry (first, second, third . . .) is used as an independent variable. This variable can empirically reflect the theoretical long lived share advantages of pioneering brands argued by Schmalensee (1982) and Lane and Wiggins (1981). If, as theorized, the early entrant becomes the standard of comparison and subsequent brands require consumers to make additional investments in learning, the order of entry variable will be negatively correlated to the share index. This variable is supplemented by another which is defined as the number of years between the *n*th entry and the one which immediately preceded it. Being the second brand in the category may have a different share effect if the lag between the pioneer is one year rather than two, three, or four years, Whitten (1979) stressed the importance of a firm being early after a new trend is established. Advertising is represented by the total advertising expenditure over the last three years by the *n*th brand to enter the category divided by that of the pioneering brand. This variable reflects the sustaining level of advertising spending and allows the order of entry effect to be modified by the application of marketing resources.

Differential product positioning has been identified as another moderator of the effect of order of entry. The Bond and Lean (1977) and Whitten (1979) studies stress its significance. Robinson and Fornell (1985) and Hauser and Shugan (1983) also argue for its importance. One method of constructing a positioning variable is by combining the product attribute ratings to estimate the utility for a brand. (See Urban and Hauser (1980) or Shocker and Srinivasan (1979) for a review.) Many procedures exist and they usually reproduce stated preferences or choices well. Another method is to use stated preferences directly. This has the advantage of avoiding variance due to lack of fits between the attributes and preferences, but has the disadvantage of not linking the attributes to preferences. Because our primary purpose is to use the positioning variable as a covariate of order of entry in explaining share rather than

supporting the design of new products, we choose to use preference to construct the positioning variable. The constant sum preferences supplied by respondents over their evoked set reflect their overall evaluations of the brand's price and features. After scaling the preferences by least square procedures (see Silk and Urban 1978), we obtain a preference value for each evoked brand j, respondent i and category c (V_{ijc}). We define a relative preference for a brand for each consumer and average over all individuals who evoke the brand:

$$R_{jc} = \frac{1}{I_{jc}} \sum_i \frac{V_{ijc}^{\beta_c}}{\sum_k V_{ikc}^{\beta_c}}, \tag{1}$$

V_{ijc} = preference value for respondent i and brand j in category c,
I_{jc} = number of respondents in category c who evoke brand j,
β_c = scale parameter for category c,
R_{jc} = relative preference of brand j in category c.

The value of R_{jc} is a measure of the consumers' evaluation of the product given that it is evoked. It reflects consumers' preferences that result from a specific multiattribute positioning. In most cases evoking occurs by use of the brand. If it performs well and price is low, R_{jc} will be high; if it does not perform well and price is high, R_{jc} will be low. The scale parameter β_c is estimated by logit procedures (see Silk and Urban 1978, for details) and it empirically has values in the range of 1 to 3 with a median of about 2. This scaling of preferences results in R_{jc} approximating the probability of purchase of the brand given that it is evoked. The driving forces behind R_{jc} are the measured preferences across the evoked set, but this scaling must be remembered when the statistical analysis is interpreted (see below).

Another aspect to emphasize is that R_{jc} is conditioned by evoking. The same market share (e.g., 10%) for a brand could be due to high preference conditioned on evoking and low evoking (e.g., 50% preference given evoking and 20% evoking), low conditioned preference and high evoking (e.g., 20% preference and 50% evoking) or moderate levels of both (e.g., 33% preference and 33% evoking). The variable R_{jc} is not necessarily correlated to share. Before 1974, Tylenol had a low share, but pre-test market evaluations indicated high preference by those who had used it. After Tylenol advertised and promoted its product, its share increased dramatically as the fraction of the population evoking it increased.

In our model we are interested in the positioning quality of later entrants relative to the pioneer, so we define the ratio of R_{jc} for the nth brand to R_{jc} for the first brand to enter as the variable to represent the relative preference given evoking. If the later entrant is superior, the ratio is greater than one, and if less desirable, the ratio is less than one.

The form of the model is nonlinear to reflect the hypothesis that the impact of the second brand to enter on the pioneer will be greater than the third or fourth brand. Considerable precedent exists for modeling a nonlinear response to advertising (Little 1979). Bond and Lean (1977) indicate an interaction between order, position, and marketing promotion and this can be captured in an elasticity function. Formally for brand n in category c:

$$S_{nc} = E_{nc}^{\alpha_1} P_{nc}^{\alpha_2} A_{nc}^{\alpha_3} L_{nc}^{\alpha_4}, \tag{2}$$

S_{nc} = ratio of the market shares of the nth brand to enter category c to the market share of the first brand to enter the category,
E_{nc} = order of entry of nth brand in category c ($n = 1, 2, 3, 4 \ldots$),
P_{nc} = ratio of preference given evoking for nth brand to preference for first brand

given evoking,

P_{nc} = R_{nc}/R_{1c} where

R_{jc} = preference for jth brand in category c conditioned by evoking (see Equation 1),

A_{nc} = ratio of the last 3 years advertising for nth brand to enter to the last three years advertising for first brand,

L_{nc} = number of years between n and $n-1$ brand entry plus one ($L_{nc} = 1$ if entry is in the same year).

This model captures some major theoretical phenomena. If α_1 is negative and significant, it supports the notion of an enduring share advantage for early entrants. If α_2 is positive and significant, it confirms the notion that the order of entry effect can be moderated by a product which is superior in price and features as reflected in the preferences of those who have it in their evoked set. If α_3 is positive and significant, it suggests advertising may modify the effect of later entry. If α_4 is negative and significant it would indicate a larger penalty for the nth entrant the later it arrives in the market. If the positioning (P_{nc}) and advertising (A_{nc}) indices have a value of one to reflect parity and entry is in the same year ($L_{nc} = 1$), equation (2) predicts the share ratio to be only a function of the order of entry. If E_{nc} is equal to two to reflect the second product in the market, in this case the ratio of its share to the first (S_{nc}) is 2^{α_3}. Note that in equation (2) the share ratio takes a value of one when the first brand is considered ($n = 1$).

Statistical analysis is based on a log transform of equation (2):

$$S'_{nc} = \alpha_1 E'_{nc} + \alpha_2 P'_{nc} + \alpha_3 A'_{nc} + \alpha_4 L'_{nc} \tag{3}$$

where the primes denote the logs of the respective variables defined in equation two. Note that this is a linear regression with no additive constant term (α_0). The constant would confound the interpretation of the magnitude of α's because with an additive constant in equation (3), the share index would not equal one for the first brand in the market as is required for logical consistency.

Fitting

The first application of the model is to the initial sample of 82 brands across 24 categories. Regression is used to estimate the parameters in equation (3). These regression procedures are based on 58 data points because the first brand is not appropriate for inclusion in relative share formulation given in Equation (3) (i.e., all first brand variables would have values of 0).[2] The resulting $F(4, 54)$ is 58.0 and it is significant at the one percent level. The t values also are significant at the one percent level (see Table 1) for order, positioning, and advertising. The order coefficient (α_1) is negative as hypothesized indicating that subsequent entrants are associated with reduced shares relative to the pioneering brand. The positioning effect (α_2) is positive, indicating good positioning is associated with larger shares. In this log-linear model the positioning effect increases share proportionately at each entry point. Therefore share for the nth entrant is reduced by the order effect (α_1) and modified by the positioning effect (α_2). It is possible for the nth entrant to earn a dominant share when its positioning is sufficiently superior to overcome the order effect penalty. The relative advertising coefficient (α_3) is also positive and reflects another correlate to increased

[2] An alternate approach is to include the additive constant in equation (3) and regress over the first and later entrants. This is not as theoretically attractive a procedure but the α_0 is driven toward zero by the number of first brands. Empirical application of this procedure led to an α_0 that was not significantly different from zero at the 10 percent level ($\alpha_0 = 0.12$, $t = 1.2$).

TABLE 1
Statistical Fitting Results

Variable	Parameter	Value	t Statistic
Order of Entry (E)	α_1	−0.48	−4.5*
Position (P)	α_2	1.14	6.8*
Advertising (A)	α_3	0.27	5.5*
Lag Between Entry (L)	α_4	0.04	0.6

*Values significant at 1% level. Critical value with 55 degrees of freedom and two tail test is $t = 2.7$.

share when a brand is a late entrant. Superior positioning and aggressive advertising spending would be the most likely correlates of dominance in a category by a later entrant. The parameter reflecting the time between entry (α_4) is not significantly different from zero.

Appendix 1 shows the actual and predicted values for the share indexes plotted versus the order of entry variable for three representative categories along with the unadjusted order effect $E_{nc}^{\alpha_1}$. Recall the predictions are obtained from our multivariate model so any deviation from the declining effect of order of entry (α_1) reflects positioning and/or advertising effects. For example the third entry in the antacid market (Rolaids) achieved a predicted share higher than the second entrant due to higher advertising and positioning values (A_{nc} of 1.6 and positioning value P_{nc} of 2.1). This more than compensated for the order of entry decline and the resulting predicted share is greater than the share of Digel or Tums.

In assessing these fits, we calculate R^2 at 76 percent.[3] Another measure of goodness of fit is to determine the proportion of the cases where the model prediction corresponds to the turns in the actual data exemplified in Appendix 1. There are 58 turns and the direction of actual and fitted values agrees for 45 turns or 78 percent of them.

Multicollinearity among the independent variables is low; five out of six of the pairwise correlations are less than 0.25 in absolute value. The sixth is the correlation between order of entry and the time between subsequent entries. In this data there is a moderate negative correlation of −0.37 indicating some tendency for shorter intervals between entrants as more brands enter the market. The parameter estimates are quite stable as variables are added to the regression. The order effect parameter is −0.61 ($t = -5.1$) when it is the only independent variable, −0.53 ($t = -5.9$) when the positioning variable (P) is added, −0.43 ($t = -5.7$) when the advertising variable (A) also is appended, and −0.48 ($t = -4.5$) with all the variables.

Examination of the residuals indicate that they are not significantly different from a normal distribution.[4] Heteroscedasticity was not evident. The standard deviation in the residuals was not significantly different for second and third or later entrants.[5]

[3]We calculate R^2 in this case of regression with no constant by following the procedure suggested by Judge et al. (1980 p. 253):

$$R^2 = 1 - \frac{\sum_i (P_i - Y_i)^2}{\sum_i Y_i^2}$$

where Y_i = actual values of dependent variable and P_i = predicted value.

[4]The residuals were rank ordered and divided into six approximately equally sized classes. The chi-squared statistic was calculated based on the actual frequency and the frequency expected from a normal distribution of the same mean and variance. $\chi^2 = 0.455$, $df = 3$. This implies a 99 percent chance of observing a value this high or higher from a normal distribution.

[5]The standard deviation of the residuals for brands of order of entry two was 0.537 and for order three 0.54. These are not significantly different at the 10 percent level $F(24, 15) = 1.01$. Similarly, for second versus fourth or greater $F(24, 32) = 1.5$.

The estimates have been reviewed for adverse effect from the leverage of outlying data points (Belsley, Kuh and Welsh 1980). Three data points were identified as having high leverage (Tegrin, Datril and Ocean Blend Cat Food), but when they were removed, the significant parameters (α_1, α_2, α_3) changed less than 15 percent from their original values and the t's remained significant at the one percent level.

A number of alternative forms (e.g., linear and exponential) and variable specifications (e.g., advertising as a percentage of category spending and order of entry and lag time combined as one variable to reflect years from first to nth entry) were evaluated in the statistical analysis, but none were theoretically or empirically superior to the results reported here.

In reviewing the regression results (see Table 1), the positioning variable is most significant followed by the advertising and order of entry parameters. A stepwise regression shows the relative explanatory power of the order of entry variable. If the order of entry variable is the first to be included, 32 percent of the variation is explained. Adding positioning increased the R^2 to 62 percent and including the advertising variable raised it to 76 percent. In each case the incremental variance explained was significant at the 10 percent level.

Some care must be exercised in interpretation of the advertising and positioning coefficients. Although the advertising index (A) correlates highly with the share index, this may not be due to advertising causing share changes. In fact if advertising budgets were set by a rule such as "advertising equals X% of sales," the causal relationship is one of advertising being dependent on sales. Although the interpretation of the advertising coefficient must be cautious, we assume our procedure removes a component of covariance and does not affect the interpretation of the order of entry coefficient (α_1). We observe that the variables have relatively small intercorrelations and one may consider order as a significant explanatory variable of the residual variance.

The positioning variable reflects the relative preference of brands given they were evoked. Such relative preferences when scaled by β through logit procedures provide good estimates of the probability of purchase conditioned by evoking (see equation (1)). Since past choices among evoked brands are used to estimate β and the market shares are estimated based on the unconditional fractions of past purchases, there is a danger that the correlation would be inflated. However, this threat would be greater if the scaling parameter β were fit along with the α's in equation (2) by non-linear estimation procedures. The conservative view is to consider the positioning variable as removing a component of the variance due to correlation of unconditioned market share and probability of purchase conditioned by evoking. The positioning variable (P) has a small correlation to the order variable (0.21), so the threat to the construct validity of the order effects (α_1) is low. The overall interpretation we draw from the fitting is that the order of entry effect is significant after considering the effects of advertising and product positioning.

Predictive Testing

The above results are encouraging, but they should be viewed with some caution because many regressions were run to find them. In order to gain more confidence in these results, predictions were made on a new sample of data that became available after the fitting analysis. This data set contained 47 new brands across 12 categories.[6]

[6]Two of the categories were in the fitting exercise, but predictions were made on five new entrants in these two categories.

The parameter estimates (α's) reported in Table 1 and the observed independent variables for the new sample are used in equation (3) to predict the new share ratios. Appendix 2 shows a representative set of the actual and predicted share ratios. The correlation between actual and predicted values for all the prediction sample is 0.85 (the corresponding value in the fitting is 0.81). The predicted turns correspond with 73 percent of the actual turns (the corresponding value in the fitting is 78). The root mean squared error in the raw share data (e.g. not transformed by logs) is 0.47; the corresponding value in the fitting data is 0.60. The predictive results are similar to the statistical fitting results and the samples are not systematically different.[7]

We can gain insight into the nature of the errors in prediction by examining Theil's U^2 measure (Theil 1966, p. 28; Bliemel 1973):

$$U^2 = \frac{\sum_i (P_i - Y_i)^2}{\sum_i Y_i^2} \qquad \text{where} \tag{4}$$

P_i = predicted observation i,
Y_i = actual observation i.

U^2 represents the sum of the squared deviations as a proportion of the sum of squares of the actual values. In this application it has an additional interpretation. Consider a revised U^2 where P_0 reflects the null hypothesis of no order of entry effects or a share index of 1.0:

$$\tilde{U}^2 = \frac{\sum_i (P_i - Y_i)^2}{\sum_i (P_0 - Y_i)^2} \tag{4A}$$

Recall we are using log transforms for all values and note $P_0 = \ln(1.0) = 0$. Equation (4A) reduces to equation (4) in this case. Therefore, we can interpret the U^2 in equation (3) as the sum of squares of the error in prediction as a fraction of the sum of squares of the deviation of the new data from the null hypothesis values reflecting no order of entry effect. In our application the U^2 value is 0.21 and reflects good prediction.[8]

Finally, the ninety percent confidence intervals for the prediction of the share indices were calculated (Theil 1971, pp. 122–123, 134–136). The intervals contained all the actual values and this implies that the differences between predicted and actual values are smaller than would be expected by random errors based on equation three. Overall, the positive predictive testing results support the adequacy of the model.

Pooled Data Analysis

To reflect the total information in our data, we pooled both samples and re-estimated equation (3) over the 129 brands. The fits were again good: $F(4, 91) = 102$, $R^2 = 77.2$ percent. 76 percent of the turns were matched by the predictions and the root mean square error was 0.54. The parameter values are given in Table 2 with their associated t statistics. The order, positioning, and advertising parameter estimates are

[7] A test of the differences of the means of the independent variables across the fit and prediction samples indicated no significant difference at the ten percent level. A Chow test was done to see if the parameter estimates for equation (3) are different in the two samples. $F(58, 33) = 0.43$ indicates no significant difference at the 10 percent level.

[8] Note, this is also one minus the R^2 calculated for a regression with no constant. See footnote 3. Further analysis by Theil's decomposition of the mean squared deviations of predicted (P_i) and actual (Y_i) values to reflect differences in means, correlation and random disturbance indicates only two percent of deviation is due to systematic difference in the samples (Theil 1966, pp. 33–35).

TABLE 2
Statistical Results for Pooled Data

Variable	Parameter	Coefficient Value (α)	t Statistic
Order of Entry (E)	α_1	− 0.49	− 6.5*
Position (P)	α_2	1.11	9.5*
Advertising (A)	α_3	0.28	7.2*
Lag Between Entry (L)	α_4	0.07	1.5

* = significant at one percent level.

significant at the one percent level. In these data the coefficient for the variable reflecting the number of years between entries (α_4) is not significantly different than zero.[9] The magnitude of the significant coefficients are almost identical to the fitting results (see Table 1).

The standardized regression coefficients (β) are shown in Table 3. The positioning variable has the greatest impact on share, followed by advertising and order of entry. The caveats on interpretation outlined above continue to apply. Although not the largest effect, order of entry continues to be a significant explanatory variable for relative market share.

The decreases in share upon subsequent entry implied by the pooled estimates are shown in Table 4 in terms of relative and absolute shares. These values represent the case when all products are equal ($P_{nc} = 1$), all later entrants advertise at the same level as the pioneer ($A_{nc} = 1$) and there is one year or less between each entry ($L_{nc} = 1$). Other appropriate values could be simulated with the parameters in Table 2 and

TABLE 3
Standardized Regression Coefficient-Pooled Data

Variable	Coefficient	Value
Order of Entry (E)	β_1	− 0.21
Position (P)	β_2	0.57
Advertising (A)	β_3	0.44
Lag between Entry (L)	β_4	0.07

TABLE 4
*Order of Entry Penalty**

Entry Order	Share Relative to Pioneering Brand	Shares (%) 1st	2nd	3rd	4th	5th	6th
First	1.0	100	—	—	—	—	—
Second	0.71	58.5	41.5	—	—	—	—
Third	0.58	43.6	31.0	25.4	—	—	—
Fourth	0.51	35.7	25.4	20.8	18.1	—	—
Fifth	0.45	30.8	21.9	17.9	15.5	13.9	—
Sixth	0.41	27.3	19.4	15.9	13.8	12.4	11.2

**Note*: These values are calculated based on equation (2) with $P_{nc} = 1$, $A_{nc} = 1$ and $L_{nc} = 1$ and the parameters in Table 2.

[9]Although not significant the positive sign is unexpected. It appears to reflect a −0.33 negative correlation of lag between entries (L) and order of entry (E) variables. Later entrants are associated with shorter intervals. Dropping the lag between variable and re-estimating the other parameters results in $\alpha_1 = 0.42$ ($t = -8.0$), $\alpha_2 = 1.10$ ($t = 9.3$), $\alpha_3 = 0.28$ ($t = 7.1$) or very little change in the estimates.

equation (2). The pioneer's share drops from 100 percent to 27.3 percent after five additional entrants, but a long-run premium is evident. This is especially true with respect to later entrants with equivalent products and advertising spending. In the case of six brands the pioneer has the dominant share position and a 16.1 share point advantage over the sixth entrant. The estimates in Table 4 suggest that the second brand will at equilibrium earn less than three quarters of the share of the pioneering brand if its advertising and positioning are equal. The third brand would similarly earn a share of about six-tenths of the first brand to enter with a parity product and the fourth about one half. As the number of brands increases, the incremental order effect penalty decreases and advertising and positioning become the determining effects on share.

Implications

The results of our analysis imply a significant market share penalty for later entrants. However, a number of caveats should be considered. First, these data represent only brands that survived in the market. If a later brand entrant failed and was removed from the market, it would not be included in these data. If such brands were present and had been observed, they would have order of entry values greater than one and most likely a low share index. Either their low shares would be reflected in their advertsing and positioning levels or in a more negative order of entry parameter. That is, the order effect found in this study may understate the penalty for late entry in this situation. In the case that the pioneer failed we would have no category to analyze unless a later entrant subsequently succeeded. If the pioneer fails after a second entrant, we would be in danger of over-estimating the magnitude of the effect of later entry unless the advertising and positioning variables captured the reasons for failure. We are not aware of the existence of this situation in the categories we studied. A final caveat is that although most of the later entering brands have been in the market for a long time (89% have been on the market five years or more), a small fraction were relatively recent (4% for 2 years, 1% for 3 years, and 6% for 4 years). This small fraction of the data may reflect short-term rather than long-run order of entry effects. However, dropping recent brands changed the parameter estimates relatively little.[10]

There are strategic implications from this study for both later entrants and pioneers. Subject to the above caveats, later entrants should plan on achieving less share than the pioneering brand if they enter with a parity product. In Table 4, the sixth brand potential is reported as 11.2 share points if it is an equal product and advertising spending is at the level of the pioneer. In many cases the sixth firm would not find it profitable to spend at the level of the pioneer who has almost 2.5 times as much share. For example, if the advertising spending is 40 percent of the pioneer's spending level, share potential with the advertising parameter of 0.28 (from Table 2) drops from 11.2 to 8.7 share points. In many cases this may not make entry attractive. The defensive strategy of the pioneer may also deter entry. If advertising increases and price cuts are matched by the innovator, the later entrant may never gain share parity with the pioneer.

A preferred strategy may be to develop a superior product with either unique benefit features and/or a lower price. When this is backed by aggressive advertising spending, a high share can be achieved. Our data demonstrated several cases where the later entrant dominated the pioneer (see Appendices 1 and 2). The model represented by equation (2) can be used to estimate approximately how much money could be spent

[10]The order coefficient is $\alpha_1 = -0.41$ ($t = -5.1$) when brands less than four years old are dropped from the regression.

in advertising to make up for being a later entrant. For example, if the second brand in the market wanted to earn the same market share as the first it would have to spend 3.4 times more in advertising ($E_{nc} = 2$, $A_{nc} = 3.4$ and $S_n = 1.0 = (2^{-0.49})(3.4^{0.28})$) or have a 3.4 times more effective advertising copy or a mixture of both. Another way for the second brand to match the pioneer's share is to have a product which generates 36 percent more preference after evoking ($E_{nc} = 2$, $P_{nc} = 1.36$ and $S_n = 1.0 = (2^{-0.49})(1.36^{1.11})$) or a combination of advertising and positioning advantages (e.g., 27.9 percent better product and 27.9 percent better or more advertising). Although the best level of spending is not specified by our model, the advertising, positioning, and entry parameters are important inputs to a profit model (e.g., Urban 1970 or Little 1975).

Firms aiming at developing pioneering brands should be encouraged by the availability of a long run market share reward for their innovation. Although the pioneer's share does decrease as each new firm enters, the pioneer retains a share differential. The size of this reward depends upon the presence and strategies of later entrants. The values in Table 4 show the innovator's share dropping from 100 percent to 58.5 percent after the second brand enters, to 43.6 percent after the third entrant, and to 35.7 percent after the fourth parity brand enters. This share decline will be greater if other brands can achieve a superior positioning (product features and/or price). The pioneer can minimize this risk by taking care to occupy the preferred positioning with its pioneering brand. This strategy preempts the competitor's ability to develop a superior positioning. If the pioneer does not carefully design its product and an improved product is subsequently introduced and aggressively promoted by a competitor, the market share reward for innovation may be lost. The pioneer also should consider aggressively defending its brand with advertising and thereby preventing competition from gaining an advertising dominance.

Future Research

This empirical cross category study of order of entry effects indicates the presence of an important market phenomenon. Our results are consistent with those found empirically by Bond and Lean (1977), Whitten (1979), Biggadike (1976), and Robinson and Fornell (1985), as well as the theoretical work of Schmalensee (1982) and Lane and Wiggins (1981). We believe that this topic deserves additional attention from researchers.

One direction of further research is to extend our study to include a price variable. Large sample audit or electronic checkout (UPC) data would provide the best measure of this variable. Price may moderate the order of entry penalty. Price expectations also could affect the rewards for pioneering. If consumers expected prices to decline, pioneers would gain fewer sales before later entrants arrived. The share advantage would be lower and production cost declines due to learning would be smaller. Another variable that could be empirically considered is promotional spending. We have included advertising, but expenditures on promotion might explain more of the residual variance. Likewise, differences in the extent of distribution could be a correlate to market share ratios. Introductory spending may explain some of the variation in the mature market shares analyzed here. We have only included the most current three years of advertising in our statistical analysis. A final moderating variable that could be added would consider whether the brand was part of a wider product line with a carryover of brand identification. An improved data base would be a time series for each brand with price, advertising, promotion, distribution (e.g., UPC or audit) along with survey measures of perception and preference. We are pursuing such a data base to enable a time series cross sectional analysis of the effects of order of entry. It would allow more variables to be considered and a modeling of long and short-run advertising and entry dynamics.

A statistical aspect that could benefit from additional research is the examination of alternate structural models. One such alternative is based on viewing advertising and positioning as proxies for a latent "performance" variable. Such a structure could be analyzed by reverse regression (Conway and Roberts 1983, Goldberger 1984 and Vanhonacker 1984). We feel our assumption of advertising and preference given evoking as exogenous determinants of share is justified, but alternatives could be considered.

Individual differences within categories could be investigated. If individuals have different evoked set sizes and compositions, the order of entry of brands will be different and the share of choices for consumers within various evoked set classes can be compared to test hypotheses. The fraction of the respondents selecting a new product may also vary as a function of evoked set size and could be investigated within each category used in this study (see Lucas 1984).

Another direction of research could be aimed at determining the behavioral and microeconomic bases for the order effects we have statistically identified. Schmalensee (1982) hypothesizes the reluctance of an individual to try a second entry if the pioneering product works as the core phenomenon. If the pioneer has occupied the best position-combination of benefits and price, the pioneering product may be placed in a premier location in an individual's memory so that later entrants will suffer a memory recall and evaluation disadvantage. Superior distribution and more shelf facings are often obtained by the pioneer; these effects of in-store awareness may explain some of the entry effects. The defense strategies utilized by the innovator may create barriers to entry that penalize the share of new entrants. Research is needed to formulate and test alternative hypotheses. Historical and survey data will be useful but behavioral experiments based on information processing (Bettman 1979) may be required to obtain a definitive understanding of the micro phenomenon.

Finally, we did not consider profit optimizing strategies in this paper. Explicit management science models could be built to maximize long-run profit. Works by Hauser and Shugan (1983), Hauser and Gaskin (1983), and Lane (1981) are relevant to setting the best defensive strategy for the pioneering brand. Extending these models for order of entry, equilibrium competitive conditions, and product lines are important research needs.

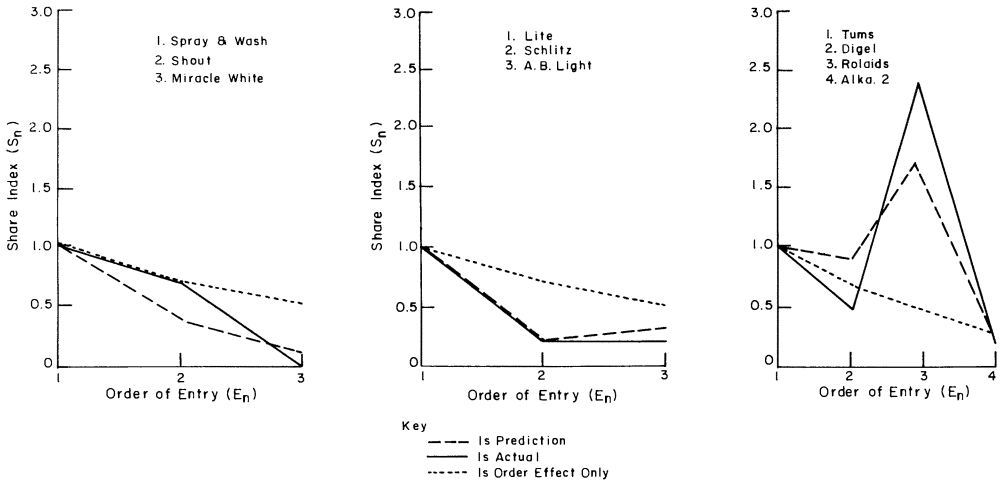
The phenomena surrounding order of entry are interesting research topics and important to firms in formulating new product strategies. Our study of frequently purchased consumer brands adds to the empirical body of knowledge and is one step toward identifying and understanding the effects of order of entry on market share.[11]

Appendix 1 Fitting Data and Results

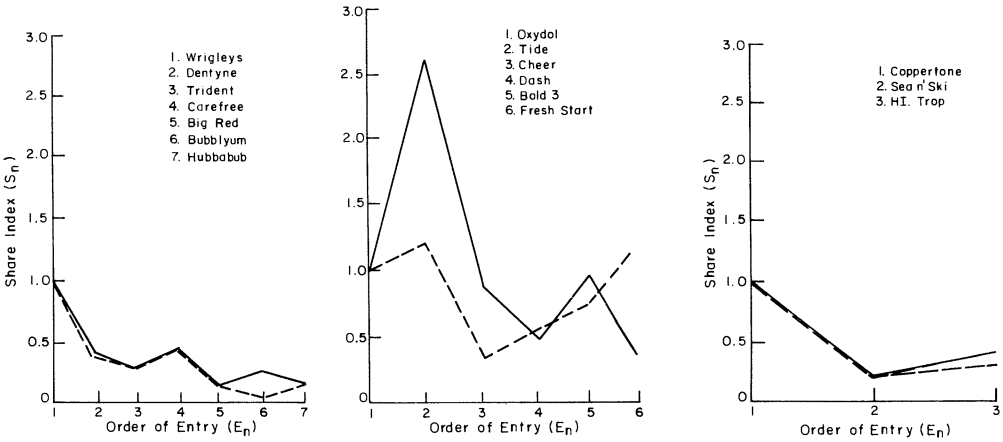
Other Categories in Fitting Data
(Plots can be obtained from the authors or *Management Science*)

Presoak	Fabric Softener	Furniture Polish
Instant Soup	Non-Chlorine Bleach	Steak Sauce
Hi Filtration Cigarettes	One Step Wax	Spray Cleaner
Cat Food	Air Freshener	Pre-Wash Spray
Window Spray Cleaner	Antacid	Freeze Dried Coffee
Deodorant Soap	Sanitary Pads	Liquid Detergent
Non-Aspirin Pain Relievers	Tampons	Anti-Dandruff Shampoo

[11]We would like to thank Management Decision Systems, Inc. for supplying the data for this study. Phil Johnson was especially valuable in generation and initial exploration of the data. Our thanks to Bill Robinson and our MIT colleagues for their comments and insights on our work and to Janny Chen, Dorothy Claydon, Scott Frederick, Wendy Lucas, and Fareena Sultan who aided in the data analysis.



Appendix 2. Prediction Results



Other Categories in Prediction Sample
(Plots available from authors
or *Management Science*)

Pain Relievers	Spaghetti Sauce
Food Wraps	Laxatives
Food Bags	Shampoo
Antacid	Skin Cream
Liquid Detergents	Foot Powder
Sleeping Aids	

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